REMARKS

DRAWINGS

Applicant has noticed that the Examiner has not indicated in the Office Action Summary (PTOL-326) whether the submitted drawings have been accepted. Applicant respectfully requests the Examiner to indicate whether the drawings submitted on the filing date of the present Application were accepted or objected to by the Examiner.

OBJECTIONS

SPECIFICATION

The Office Action has objected to the specification on line 6, page 16. The Office Action indicates that the phrase "In one embodiment" apparently should be changed to "In the same embodiment." After reviewing the specification, the Applicant respectfully submits that what is disclosed in the specification does not require correction or modification.

The Applicant stands by the argument previously made with respect to this objection, as was presented in the Response to Office Action dated October 17, 2006. In response to the Examiner's objection, the Applicant fails to see how adherence to a conventional process provides a "new and useful process, machine, manufacture, or composition of matter, or any new useful improvement thereof", as may be referenced in 35 USC § 101. Applicant feels that his use of variables as described in the specification is clear and that he describes a new and useful process of effectively correcting and detecting errors using a multi-stage decoding process when storing data in a media of a storage device.

In section 1 of the Office Action, the Examiner stated that "applicant's parameters 't' and 'k' are described as inevitably being equal to each other (at least according to the equation for the first polynomial in paragraph 0016, where 't' is replaced by 'k'), and are only used after a multiplication by two which factor also lacks any described relation to any code generator polynomial design objective." Applicant respectfully disagrees with this statement because the specification of the Application, for example, states the following:

> "In one embodiment, t=24 or 2t=48. At step 208, the encoder/decoder subsystem generates p(x) as a polynomial of degree 2k, in which its roots are consecutive powers of the same primitive element. In one embodiment, k=2 or 2k=4."

As recited in the above passage, t and k are variables that do not necessarily have to be equal to each other. For example, as stated in the above excerpt from the specification of the present Application, t=24 and k=2.

Furthermore, the Office Action states that "applicant's generator polynomial selection process appears to be an artificial and arbitrary breaking up of the conventional process of selecting $2r = (2t + d)$ or $2t$ consecutive roots into a two-part process of selecting two consecutively-positioned consecutive sets [of] roots to arrive at $r = (2t + d)$ or $r = 2t$." Applicant respectfully disagrees with this Examiner's statement. Applicant's use of 2 polynomials is not arbitrary and relates to using a novel "three stage decoding process" as disclosed in page 18 of the present Application. Applicant's generator polynomial is a genuine and novel approach to combining an error correction using polynomial f(x) with an error detection process using polynomial p(x) to yield a generator polynomial g(x) that is used to encode data using a *single*

code by way of generating the remainder polynomial r(x), as described in page 17 of the present Application.

> "At step 216, the remainder polynomial, r(x), is generated by dividing C(x) using g(x). The remainder polynomial, r(x), contains 2(t+k) parity or redundancy terms. Then at step 220, the encoded codeword, C*(x) is generated by appending the 2(t+k) parity or redundancy symbols to the data portion of the codeword, C(x)."

Use of this remainder polynomial (obtained from combining f(x) and p(x) to yield the generator polynomial g(x) and further using g(x) as a divisor for the codeword, C(x)) allows one to employ a three stage decoding process. The three stage decoding process is illustrated in Figures 3A and 3B of the present Application. The three stage decoding process is described in page 18 of the present Application.

> "In one embodiment, the decoding algorithm utilizes a 3 stage decoding process in which 1) a first error correction is performed at the first processing stage using f(x), 2) an error detection check is performed at the second processing stage using p(x), and 3) a second error correction is performed at the third processing stage using g(x)."

As disclosed in the present Application, f(x) and p(x) may be implemented such that the first error correction corrects up to a maximum of t errors where t corresponds to one-half the degree of f(x). The second error correction may be implemented, if the error detection check determines that errors still remain after performing the first error correction, such that the second error correction corrects up to t+k errors where k corresponds to one-half the degree of p(x).

Therefore, what is described in the present Application describes a new and useful process and a system to implement that process. As a consequence, Applicant respectfully requests that the Examiner withdraw his objection to the specification.

REJECTION OF CLAIMS 26-27 AND 30-31 UNDER 35 U.S.C. § 102(b)

Claims 26-27 and 30-31 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,363,511 ("Massoudi"). Regarding the rejection, the Office Action states:

> Massoudi discloses a decoder (Fig. 4B) for Reed-Solomon product-code codewords, including two stages of correction (410, 414). Massoudi also mentions the possibility of a software-based implementation (column 13). Massoudi's row correction stage (410) provides a "first processing stage used to correct a first maximum number of symbol errors in said encoded codeword," using the correction power of the row codewords. The number of errors correctable in row-decoding is of course inherently equal to half the number of check symbols in each row (and also half the degree of the row code generator polynomial) times the number of rows. Massoudi's column and EDC syndrome generator stage (412) provides a "second processing stage used to detect symbol errors" as an EDC is an error detection code. Massoudi's column correction stage (414) provides a "third processing stage used to correct a second maximum number of symbol errors in said encoded codeword." The number of errors correctable in column-decoding is of course inherently equal to half the number of check symbols in each column (and also half the degree of the column code generator polynomial) times the number of columns.
>
> Massoudi's row correction uses 10 redundant symbols per row and Massoudi's column correction uses 16 redundant symbols, capable of correcting more errors (8 errors correctable per column correction vs. 5

> errors correctable per row correction, using the DVD standard product code. Consequently, Massoudi's first error correction stage corrects up a first number (5) of errors per row codeword, while Massoudi's second error correction stage corrects up [sic] a sum of a first number (5) and a second number (3) of errors for a total of 8 errors correctable in Massoudi's second stage per column codeword. Both the first and second numbers (5 and 3) can be said to respectively correspond to half the degrees of any polynomials of degree 10 and 6, consecutive roots or not.

See Office Action at pages 4-5.

The Examiner states that "Massoudi discloses a decoder (Fig. 4B) for Reed-Solomon product-code codewords, including two stages of correction (410, 414)." The Examiner alleges that Massoudi's row correction stage (410) provides a "first processing stage used to correct a first maximum number of symbol errors in said encoded codeword," that Massoudi's column and EDC syndrome generator stage (412) provides a "second processing stage used to detect symbol errors", and that Massoudi's column correction stage (414) provides a "third processing stage used to correct a second maximum number of symbol errors in said encoded codeword." In response to the Examiner's statements, the Applicant respectfully submits that what the Examiner wishes to show a teaching of is not recited in independent Claim 26. For example, Claim 26 does not recite a "second processing stage used to detect symbol errors." Rather, Claim 26 recites a second of said two processing stages that "is used to correct up to a sum of said first number plus a second number of errors in said encoded codeword." Thus, for this reason alone, the Applicant respectfully submits that the Office Action has not shown a teaching of what is recited in Claim 26. Further, in another example, Claim 26 does not recite a "third

processing stage used to correct a second maximum number of symbol errors in said encoded codeword." Nowhere does Claim 26 recite a "third processing stage" or a "second maximum number of symbol errors." Thus, for this reason alone, the Applicant respectfully submits that the Office Action has not shown a teaching of what is recited in Claim 26.

In addition, the Applicant has been unable to locate the verbiage in Massoudi that substantiates the statements the Examiner makes in the Office Action. If the Examiner wishes to maintain his rejection to independent Claim 26, he must show a teaching of each and every element and/or feature recited in Claim 26. Therefore, the Applicant requests the Examiner to show a teaching of each and every element and/or feature recited in each clause of independent Claim 26.

Regarding Examiner's reference to element 410, the Applicant references the following passage obtained from Massoudi at col. 6, lines 48-52:

> "The on-the-fly row correction circuitry 410 receives a data stream of ECC block data in rows and detects and corrects row errors on the fly up to a number of errors, which is programmable by a user."

Furthermore, the Applicant makes reference to the following passage from Massoudi at col. 6, lines 63-66 regarding element 414:

> "The column and EDC syndrome generator circuitry 412 computes syndromes for all columns and also determines all the syndromes for EDC of each of the sectors in an ECC block."

Applicant respectfully submits that the Examiner's reference to elements 410 and 412 of Massoudi does not teach or disclose what is recited in the second clause of independent Claim

26. Elements 410, 414 of Figure 4B of Massoudi does not disclose "a decoder for decoding said encoded codeword that is read from said media of said storage device using at least two processing stages of error correction, wherein a first of said two processing stages is used to correct up to a first number of errors in said encoded codeword and a second of said two processing stages is used to correct up to a sum of said first number plus a second number of errors in said encoded codeword, said first number corresponding to one-half the degree of a first polynomial, said second number corresponding to one-half the degree of a second polynomial", as recited in the second clause of independent Claim 26. The Applicant does not see how an On-The-Fly Row Correction Circuitry 410 and a Column Correction Circuitry 414 teaches what is recited in the second clause of Claim 26. Applicant requests the Examiner to explain how an On-The-Fly Row Correction Circuitry 410 and a Column Correction Circuitry 414 teach the one or more elements of the second clause of Claim 26. Otherwise, the Examiner should withdraw the rejection to Claim 26. For each of the foregoing reasons, Applicant respectfully submits that Claim 26 is allowable and requests that the Examiner withdraw his rejection. The Applicant respectfully submits that Claims 27 and 30-31 are also in condition for allowance since they depend on an allowable Claim 26.

The Applicant respectfully submits that because of the foregoing reasons, Claim 26 contains patentable subject matter and should be allowed. As a result of providing the foregoing arguments with respect to independent Claim 26, the Applicant has not commented on the remarks made by the Examiner regarding dependent Claims 27 and 30-31 but reserves the right to do so in the future should the need arise. Since Claims 27 and 30-31 depend on allowable Claim 26, Applicant respectfully submits that Claims 27 and 30-31 are in condition for allowance. The Applicant respectfully requests allowance of Claims 26-27 and 30-31.

REJECTION OF CLAIMS 1, 2, 4, 5, 7 AND 10 UNDER 35 U.S.C. § 102(e)

Claims 1, 2, 4, 5, 7 and 10 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,978,415 ("Weng '415"). Regarding the rejection, the Office Action states:

> Weng '415 discloses (column 4, lines 32-40) selecting a generator polynomial $g(x)$ for a Reed-Solomon code as a product of a first polynomial and a second polynomial, $g(x) = gi(x) \cdot g2(x)$. The recited decoding purposes for selecting the first and second polynomials in encoding is given no patentable weight, it being understood that well-known capabilities for error correction and for error detection decoding are inherent in both $g_1(x)$ and in $g_2(x)$ used in encoding. Of course the error correction powers of $g_1(x)$ and $g_2(x)$ are inherently equal to one-half their respective degrees, by definition, and both $g_1(x)$ and $g_2(x)$ have roots that are powers of a primitive field (e.g. as in column 6, line 40).

See Office Action at page 5.

The Applicant respectfully submits that the invention claimed in the manner of Claim 1 recites a first polynomial used to perform a *first error correction* while the second polynomial is used to perform *an error detection check* (emphasis denoted in italics). The Office Action does not show a teaching of these two steps as recited in Claim 1. Furthermore, Applicant respectfully submits that Weng '415 does not teach the method of these two steps, as recited in the first and second clauses of Claim 1.

The Applicant respectfully submits that because of the foregoing reasons, Claim 1 contains patentable subject matter and should be allowed. As a result of providing the foregoing

arguments with respect to independent Claim 1, the Applicant has not commented on the remarks made by the Examiner regarding dependent Claims 2, 4, 5, 7 and 10 but reserves the right to do so in the future should the need arise. Since Claims 2, 4, 5, 7 and 10 depend on allowable Claim 1, the Applicant respectfully submits that Claims 2, 4, 5, 7 and 10 are in condition for allowance. The Applicant respectfully requests the allowance of Claims 1, 2, 4, 5, 7 and 10.

REJECTION OF CLAIMS 8 AND 9 UNDER 35 U.S.C. § 103(a)

Claims 8 and 9 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Weng '415 in view of U.S. Patent No. 5,948,117 ("Weng '117") or in view of U.S. Patent No. 5,778,009 ("Fredrickson"). Based on at least the foregoing argument with respect to Claim 1, the Applicant believes that Claim 1 is in condition for allowance. Therefore, Claims 8 and 9 (which depend from independent Claim 1) are in condition for allowance. As a result of providing the foregoing arguments with respect to independent Claim 1, the Applicant has not commented on the remarks made by the Examiner regarding dependent Claims 8-9, but reserves the right to do so in the future should the need arise.

ALLOWABLE SUBJECT MATTER – CLAIM 11, NEW CLAIMS 32-48

Claim 11 was amended to correct a typographical error.

The Examiner has objected to Claims 3 and 6 as being dependent upon a rejected base claim, but would be allowable if rewritten in correct and independent form including all of the limitations of the base claim and any intervening claims. The Applicant has rewritten Claim 3 in independent form to include all of the limitations of base Claim 1. Likewise, the Applicant has

rewritten Claim 6 in independent form to include all of the limitations of base Claim 1. Applicant respectfully submits that new Claims 32 and 33 are in condition for allowance.

Independent system Claim 34 is drawn to a system that comprises the elements and/or features presented in its corresponding allowable method claim (i.e., Claim 11). Claim 34 comprises the allowable subject matter of Claim 11 indicated by the Examiner. Therefore, independent Claim 34 is in condition for allowance. Furthermore, Claims 35-41 (which reflect allowed Claims 12-18) are in condition for allowance because these claims depend on allowable independent Claim 34.

Likewise, independent system Claim 42 is drawn to a system that comprises the elements and/or features presented in its corresponding allowable method claim (i.e., Claim 19). Claim 42 comprises the allowable subject matter of Claim 19 indicated by the Examiner. Therefore, independent Claim 42 is in condition for allowance. Furthermore, Claims 43-48 (which reflect allowed Claims 20-25) are in condition for allowance because these claims depend on allowable independent Claim 42.

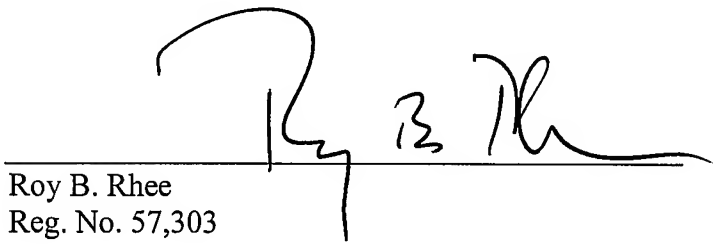
CONCLUSION

Applicant gratefully acknowledges the allowance of Claims 11-25 and the indication that Claims 3 and 6 contain patentable subject matter. Based on at least the foregoing Applicant's arguments, the Applicant believes that Claims 1-27 and 30-48 are in condition for allowance. A Notice of Allowance is courteously solicited. Should anything remain in order to place the present application in condition for allowance, or should the Examiner disagree or have any question regarding this submission, the Examiner is kindly invited to telephone the undersigned at (312) 775-8246.

The Commissioner is hereby authorized to charge any additional fees or credit any overpayment to the Deposit Account of McAndrews, Held & Malloy, Ltd., Account No. 13-0017.

Dated: August 8, 2007

Respectfully submitted,



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